

Theory of Plasticity and Application to Metal Forming Processes

2 units

Yoshinari Kaieda · PROFESSOR / PRODUCTION SYSTEMS ENGINEERING, MECHANICAL ENGINEERING, INTELLIGENT STRUCTURES AND MECHANICS SYSTEMS ENGINEERING

Takuo Nagamachi · ASSOCIATE PROFESSOR / MECHANICAL SYSTEMS, MECHANICAL ENGINEERING, INTELLIGENT STRUCTURES AND MECHANICS SYSTEMS ENGINEERING

Target This class introduces yield criteria of metals, plasticity theory and their application to metal forming processes.

Outline Although metal forming techniques are diverse, the primary objective is to produce a desired shape change. The major concerns of the engineer are the forces required for the operations and the properties of the work materials. Engineering plasticity and its application to metal forming processes are introduced.

Style Lecture

Keyword yield theory, theory of plasticity, compressibility, anisotropy

Relational Lecture “[Production and Manufacturing System](#)”(0.5)

Requirement Students are required to have a good understanding of undergraduate-level plasticity and fundamentals of metal forming operations.

Goal

1. To understand yield theory and slab analysis.
2. To understand fundamentals of compressive and anisotropic plasticity theories.

Schedule

1. Basic concept of yielding
2. Plastic behavior of metals under high hydrostatic pressure
3. Stress tensor and strain
4. Stress-strain curve and coordinate transformation
5. Principal stresses, invariants of stresses and Mohr's stress circle
6. Stress deviator tensor
7. Loading/unloading and yield theory
8. Exercise
9. Basic principles of Finite Element Method
10. Elastic Finite Element Method (1)
11. Elastic Finite Element Method (2)
12. Rigid-plastic Finite Element Method (1)
13. Rigid-plastic Finite Element Method (2)
14. Elasto-plastic Finite Element Method (1)
15. Elasto-plastic Finite Element Method (2)
16. Examination

Evaluation Criteria Assignments count 50% , exercises and examinations count 50%.

Textbook Predistributed printed synopses are also used.

Reference To be introduced in the class.

Contents <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=182380>

Student Able to be taken by only specified class(es)

Contact

⇒ Kaieda (M321, +81-88-656-7379, kaieda@me.tokushima-u.ac.jp) [MAIL](#)
(Office Hour: 15:00-17:00, Friday)

⇒ Nagamachi (M524, ngmch@me.tokushima-u.ac.jp) [MAIL](#) (Office Hour: 毎週水曜日 17時 ~ 18時)